REMARKS

The Applicant wishes to thank the Examiner for discussing this case on May 16, 2008. The Examiner provided helpful guidance in amending the claims; no conclusion on allowability of the claims was reached.

Examiner's Response to Arguments

In the Response To Arguments of the most recent Office Action the Examiner noted that the presently recited claim language does not present a specific order of methods and that generally prior art equipment is capable of performing the steps of the claimed language if order is not considered.

The Applicant has amended independent apparatus and method claims 1 and 21 to clearly specify the order of the steps to correct the deficiencies in noted by the Examiner. In this regard, the Applicant has adopted the approach of indicating within each step that it succeeds the previous step but other formulations would be acceptable to the Applicant.

The independent claims 1 and 21 have also been amended to emphasize that the invention deals with elasticity measurements having a direction, and thus that ultrasound measurements taken at different angles must be combined to form an elasticity measurement along a single angle, typically different from the two angles of the underlying ultrasonic measurements. This is reflected in the claim language stating:

> combining at least portions of the first and the second echo signals from the different angles related to each voxel, to produce at least one compounded strain measurement for each voxel in the region of interest along a predetermined single given angle (emphasis added).

In one embodiment, covered by claims 5 and 25, this combination involves deducing strains from each of the two underlying echo measurements, converting those strains to strains along a common axis, e.g., using an assumption about compressibility (Poisson's ratio) and combining the converted strains. See, for example, paragraph [0048]-[0050]. It should be emphasized that simply adding the magnitude of measured strain taken at two different angles together would (by ignoring directionality) produce erroneous results.

Note that this claim limitation does not rule out determining elasticity data along multiple axes, but it does require that each of these multiple axes of elasticity be derived from two angles of echo data.

Claim Rejections--35 USC §103

Claims 1, 5-7, 13-21, 25-27 and 31, 33-28 have been rejected under 35 U.S.C. §103(a) as unpatentable over Lin in view of Burcher.

As generally agreed by the Examiner and the Applicant, Lin is directed toward a Doppler method of elastography, not the quasi-static method described and claimed in the present invention. For this reason, Lin, does not meet the method limitations of claim 25 of obtaining two different compression images with static compression (Lin does not perform a quasi static compression) nor does Lin teach the apparatus limitation of claim 1 of producing the strain measurement from a relative time-displacement of the echo signals (Doppler elastography looks at frequency shift not time delay).

Importantly, because Lin is a Doppler system, Lin does not teach or suggest any method of combining echo signals taken at two different angles into an elastography measurement having a single direction. Note that it is not simply a matter of adding or averaging the measurements taken at the two angles.

Burcher considers a three-dimensional imaging system where ultrasonic measurements are taken at different angles (along slices). Further, Burcher clearly contemplates that an individual voxel will be scanned at multiple angles and these scans combined. See, for example, paragraph [0003], third line. But this combination is a simple averaging which would not work for elasticity and Bircher at no point attempts to obtain elasticity information.

For this reason, Lynn and Burcher both fail to teach determining a compounded strain according to the following claim limitation finding counterparts in claims 1 and 25:

> produce at least one compounded strain measurement for the voxel in the region of interest along a predetermined single given angle, the compounded strain measurement being produced by determining relative displacement in time of the portions of the echo signals to deduce displacement between tissue between the first compressive state and the second compressive state

Bircher teaches away from the present invention by describing a system whose purpose is to eliminate distortions caused by elastic tissue that distort a three-dimensional image. See generally paragraph [0003] where Burcher states:

> if the tissue has been distorted differently in the individual sweep scans, then compounding tends to give blurred images in which the borders of structures, such as lesions, are less clear than in the individual sweep stands, and curvilinear structures within the images are not aligned.

Thus, Burcher teaches that distortion, required for quasi-static elastography, is undesirable because it causes a blurring of images.

The Applicant agrees that Burcher would be able to provide elasticity measurements by recording the force and deformation of the tissue at the site of the transducer. But this would not meet the limitation of the claims because the elasticity measurement would not be deduced from the echo signals. As a practical matter, measuring displacement and force on the transducer would not provide useful information about elasticity of interior tissue (only at the point of transducer) and is not suggested by Bircher, probably for the reason that it is clinically unnecessary.

It is believed that claims 5-7 are also not taught by Lynn and Burcher because claim 5 requires deducing strain measurements in each of two separate echo signals at different angles and then combining them. Applicant can find no support in Lin or Burcher for the generation of two strain measurements at different angles which are then combined to produce a strain measurement at a single angle.

Claim Rejections--35 USC §103

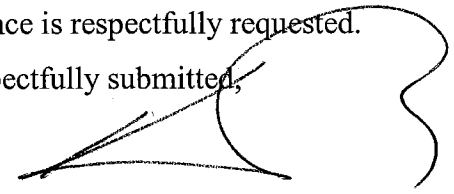
Claims 8-12, 28-30, and 32 have been rejected under 35 U.S.C. §103(a) as unpatentable over Lin in view of Burcher and Ueki.

As described in the application, the combination of ultrasonic data at different angles to deduce elasticity along a single angle can be done by making assumptions about the Poisson ratio of the material. Applicant can find no support in Ueki for this technique. The Ueki case is concerned with x-ray systems and does not appear to be used to make elasticity measurements. It is believed that the cited "Poisson distribution" in

Ueki is substantially different from the claimed "Poisson's ratio", the former being a statistical measure, the latter being a measure of material compressibility.

In light of these remarks and amendments, it is believed that claims 1, 5-21, 25-48 are in condition for allowance and allowance is respectfully requested.

Respectfully submitted,



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